LaisDcc Decoder Manual

Adapted by Buckambool Model Trains

Decoder Reset: Program CV8 = 4 in order to reset any LaisDcc decoder back to default settings.

LaisDcc decoders conform to NMRA standards and have an NMRA manufacturer ID which can be seen by reading CV8, it will read back a value of '134'. They do not support Railcom or any other protocols additional to DCC.

The 8600xx 'PanGu' series we brand as 'Standard' decoders, and do not support the connection of a stay alive capacitor, the 8700xx KungFu series which we brand 'Stay alive compatible' do allow the connection of any kind of stay alive capacitor. We do however recommend the use of either the 'Lite' or 'Pro' series LaisDcc stay alive packs.

Wire Colour Codes:

LaisDcc decoders conform to standard NMRA wire colour codes. Please reference the table below:

	Colour:	**Function:**	
	Red	Connect to track right	
	Black	Connect to track left	
	Orange	Motor right +	
	Grey	Motor left -	
	White	Front headlight (-)	
	Yellow	Rear headlight (-)	
	Green	Function output 1 (-)	
	Purple	Function output 2 (-)	
	Blue	Common positive (+)	
	Black	Ground, for stay alive - *on opposite end of decoder*	
	Blue	Positive, for stay alive - *on opposite end of decoder*	

To connect lighting or other 12V accessories to your decoder, make a circuit with any of the available function outputs as the negative connection, and use the common positive to complete the circuit.

Please note, if you are planning to connect LEDs to your decoder, you must connect an approx. 1K Ohm dropping resistor, no LaisDcc decoders support the direct connection of LEDs to the decoder. Note that locomotives with a 6, 8, Next18, 21 or PluX22 type connection socket will more than likely already have resistors fitted on the locomotive circuit board.

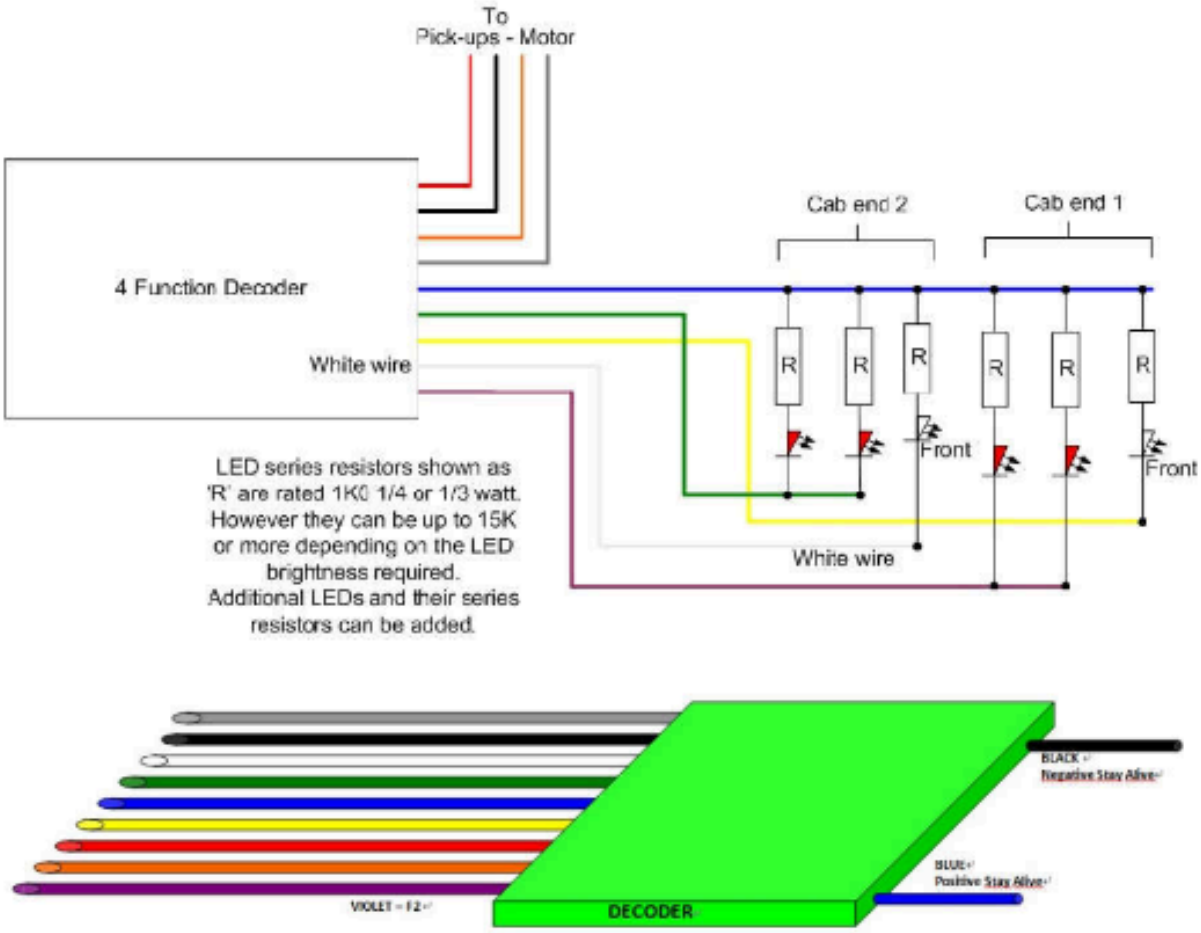
LaisDcc CVs:

LaisDcc decoders use standard CV values that are shared across many common brands of decoders. For further information, please refer to the pages following the decoder diagrams.

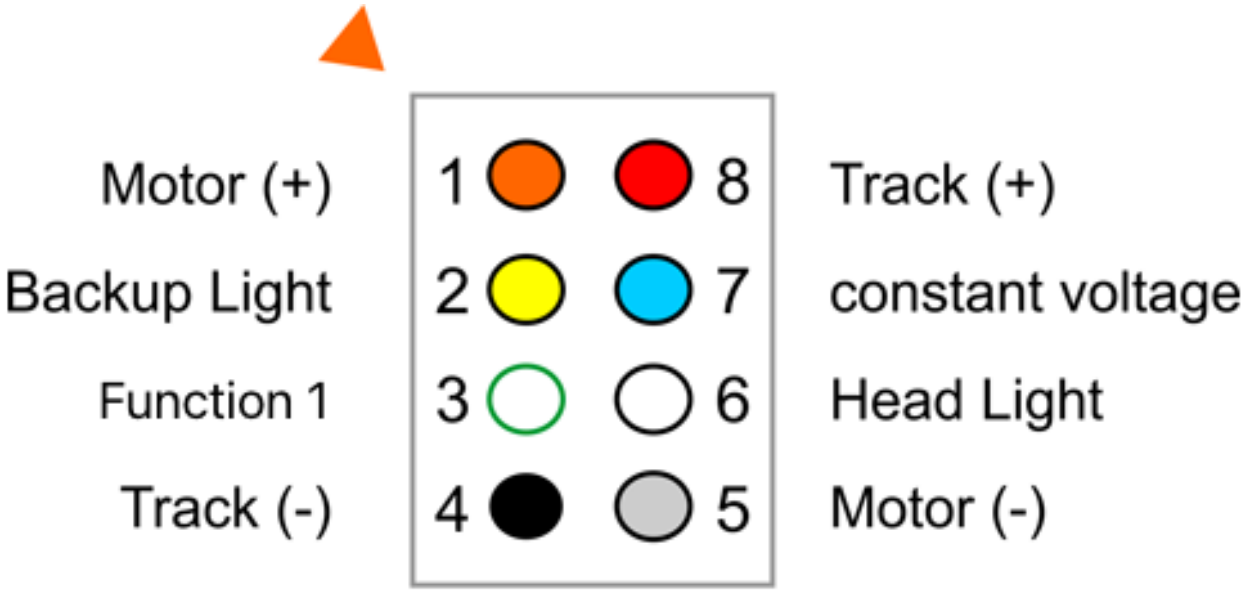
Troubleshooting/Warranty:

Every decoder is tested when manufactured. Very occasionally we find a dead on arrival decoder, or a decoder not operating correctly. Please contact us and we will organise a replacement. If your decoder burns a hole in the heat-shrink wrapping, it has been overloaded. If you require further help or support please don't hesitate to contact us.

860014 & 870014 Diagram



860021, 860020 & 870021 Diagram



NMRA 8-pin plug

A triangle or asterix symbol is often used to denote pin 1

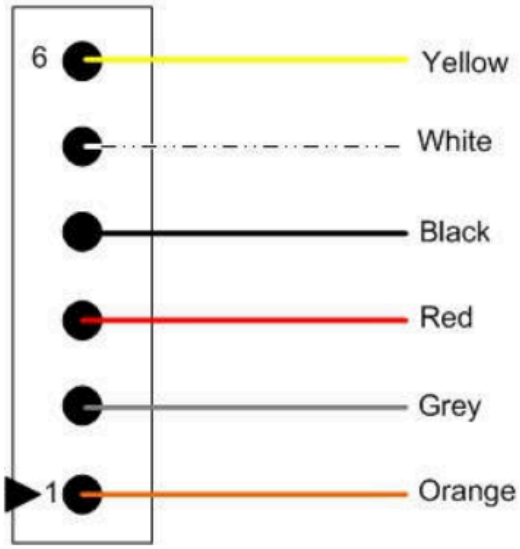
860019 & 870019 Diagram

Not used	1	22	Track R (Red)
Not used	2	21	Track L (Black)
Not used	3	20	Ground (GND)
Function 4 (Pink)	4	19	Motor (+) (Orange)
Not Used	5	18	Motor (-) (Gray)
Not Used	6	17	Not used
F0 Rev (Yellow)	7	16	+12V (Blue)
F0 Fwd (White)	8	15	Function 1 (Green)
Not used	9	14	Function 2 (Violet)
Not used	10	13	Function 3 (Brown)
Index	11	12	+5V (VCC)

Functions 3 & 4 are logic level outputs

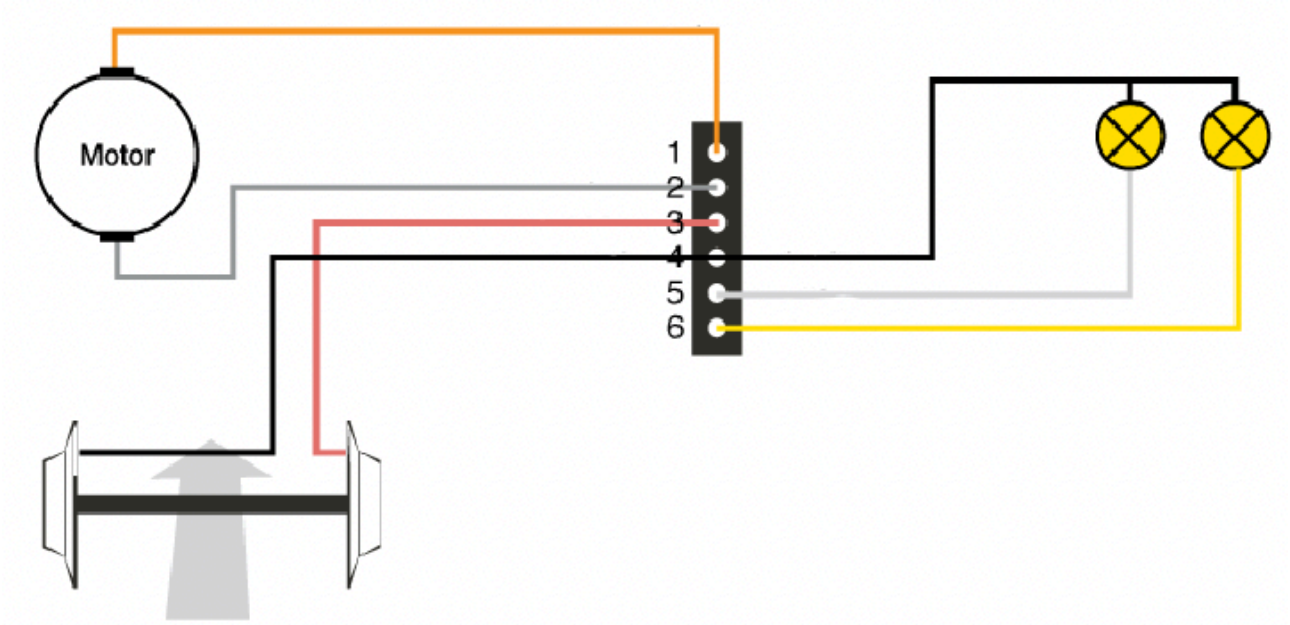
860015 & 870015 Diagram

860013 & 870013 Diagram

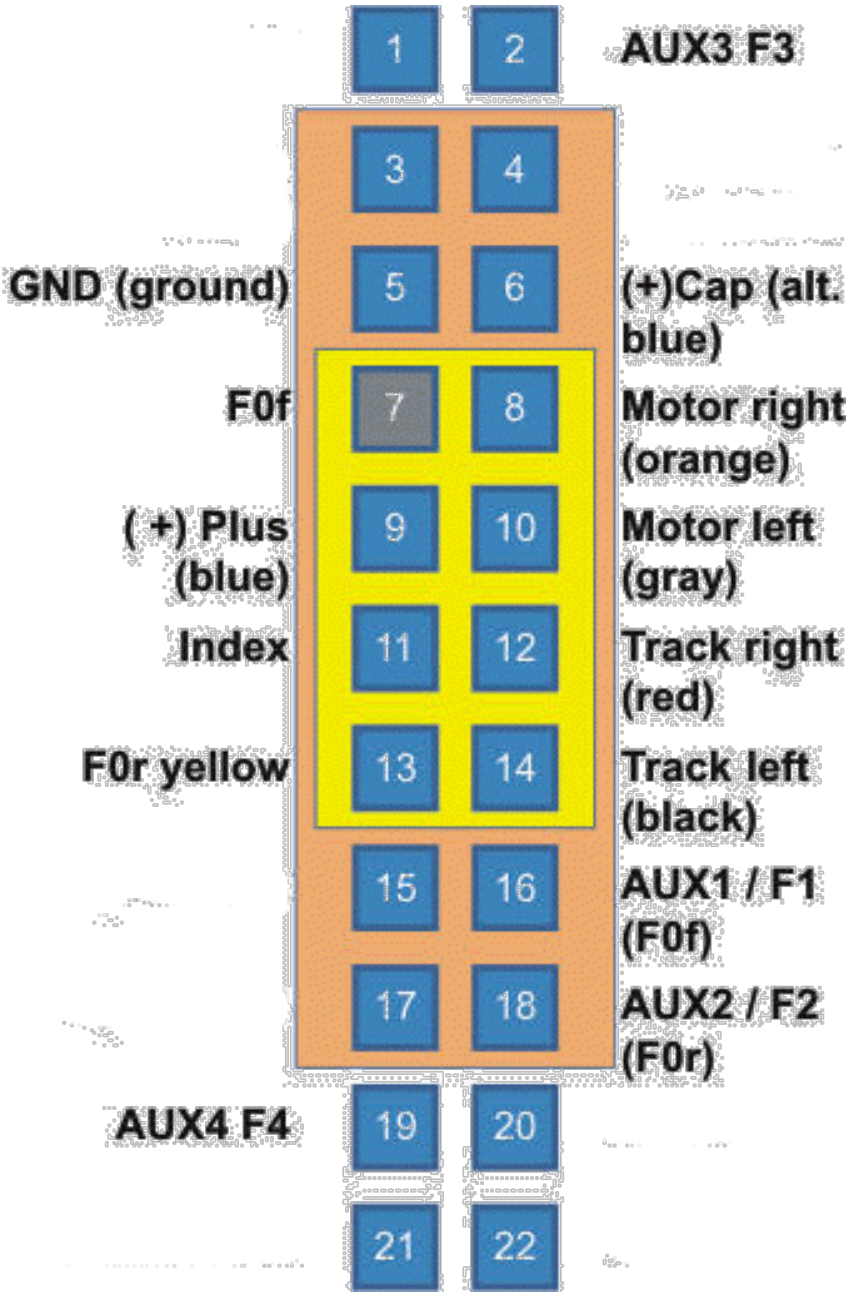


Functions:-
1 Orange - Motor Right
2 Grey - Motor Left
3 Red – Rail/wheel connection (Right rail)
4 Black - Rail/wheel connection (Left rail)
5 White - Function (Lights etc Often Headlights)
6 Yellow - Function (lights etc Often Rear red)

860012 & 870012 Diagram



870016 & 870017 Diagram



Orange box shows 870017 PluX16 decoder pin outs

LaisDcc Decoder CV List

Applies to all types of LaisDcc decoders

CV1 - Short address

Default address is 3. This can be changed to any value between 1-127

CV17/CV18 - Long address

First enable ‘extended address’ in CV29 (more info on this in the CV29 section), then program values to CV17 & 18 in order to set an address between 128 - 9999

If your DCC system does not have an extended address setting tool, please use an online calculator for determining the values of CV17 & 18

CV19 - Consist address

Suitable for easily controlling multiple locomotives of the same type via the same address.
Note: It is important to check that locos in a consist have similar programming in terms of max speed, acceleration, deceleration etc.

Can be a value between 1-127. Add 128 to your chosen number to reverse the locomotive direction. Must be different to addresses used for CV1

When a value is programmed to CV19, the locomotive will only respond to this address for drive commands from the controller.
To control lights and other functions, either the CV1 or CV17+18 address (short or long address) will need to be dialled up on the controller.
Otherwise, see below

CV21/CV22 - Consist Lighting Control

Allows the White, Yellow, Green and Purple wire to respond to instructions addressed to the consist address when programmed.

Program the following values to CV21 to enable the following function outputs:
Green wire/F1 - 1 Purple wire/F2 - 2
Program the following values to CV22 to enable the following function outputs:
White wire/F0f - 1 Yellow wire/F0r - 2

For example, you want to the F1 and F2 to respond to consist address, program a value of ‘3’ to CV21.

CV29 - Decoder Configuration

CV29 controls many important features of a decoder, such as whether it will respond to a short or long address, whether the locomotive direction is to be permanently reversed, what kind of speed table is to be used and how many speed steps will be used.

We recommend using an online calculator tool to set CV29 to your preferred value, or otherwise many DCC systems have an inbuilt CV29 programming tool.

CV15/CV16 - Decoder Lock

The Decoder Lock is used to change CVs in only one of several decoders with the same short address (CV1) or long address (CV17 and CV18) that are installed in the same locomotive. Assign a number to CV16 in each decoder (i.e. 1 to motor decoder, 2 to sound decoder, 3 or higher to other decoders) before the decoders are installed in the locomotive. To change a value in another CV of one of the installed decoders, first write the number 1 (motor), 2 (sound), or 3 or higher (other) into CV15, then send the new value to the CV to be changed. The decoders will compare CV15 to CV16 and, if the values are equal, the CV to be changed will be changed. If the values in CV15 and CV16 are different, the update will be ignored.
The default CV15 = 0, unlocks all decoders. If you set CV15 = 7, all decoders will be locked.
CV15 range is 0-7, and CV16 range is 1-6, which follows NMRA standards.
If you find after you reset the decoder you cannot read any CVs, or the address has not been set back to '3', the decoder might be locked. Please program CV15 = 0 and program CV16 = 1 on the programming track. Then set CV8 = 4 to reset again.

Lighting Effects

Each lighting output is assigned a CV which controls what kind of effect it should produce.

White = CV49	Yellow = CV50
Green = CV51	Purple = CV52
F3 = CV53	F4 = CV54

These CV's also determine what direction each lighting output will operate.

The default setting of CV49 is 0 which means it will only on at Forward.
The default setting of CV50 is 16 which means it will only on at Reverse.
The default setting of CV51 is 32 which means it will on in both directions.
The default setting of CV52 is 32 which means it will on in both directions.

The following codes can be programmed to any of these 4 CV values to change the style of lighting effect produced by each output. Add these values to the direction setting values above to produce your desired result.

Constant Bright Light effect code	=0
Random Flicker Light effect code	=1
Mars Light effect code	=2
Flashing Light effect code	=3
Single Pulse Strobe effect code	=4
Double Pulse Strobe effect code	=5
Rotary Beacon effect code	=6
Gyra Light effect code	=7
Rule 17(dimmable light) effect code	=8
Ditch Light Phase A effect code	=10
Ditch Light Phase B effect code	=11
Constant Dim Light effect code	=12
Auto Mars effect code	=13

For example: You want to make Green = Function 1 to be Random Flicker and only on when Forward. The direction code is 0 and the effect code is 1, add the direction code and effect code: 0+1=1, and program this to CV51.

Function Mapping - CV33-CV46

Find the CV value of the function output you want to remap, then program the value of the function key you want to control it. Function keys 0-6 use different CV values to keys 7-12.
For example, if you want to remap function output 2 (purple wire) to function key 3, you need to program a value of ‘16' to CV36.

One function key can be used to control multiple wires/functions, and vice versa.
To have multiple function keys operating the same lighting function, add the values of the function keys together.

The table below shows the CV values used to designate each function key.

Control Key	Value of Key
Forward	1
Reverse	2
1	4
2	8
3	16
4	32
5	64
6	128
7	4
8	8
9	16
10	32
11	64
12	128

The table below shows the CV No’s that are programmed to map a function key to a particular lighting function.

CV No.	Function	Default Key Value
CV33	Forward Headlight FL(F0F)/White Wire	1
CV34	Reverse Headlight FL(F0R)/Yellow Wire	2
CV35	Function 1/Green Wire(0-6)	4
CV36	Function 2/Purple Wire(0-6)	8
CV37	Function 1/Green Wire(7-12)	0
CV38	Function 2/Purple Wire(7-12)	0
CV39	Function 3/Brown Wire(0-6)	16
CV40	Function 4/Pink Wire((0-6)	32
CV41	Function 3/Brown Wire(7-12)	0
CV42	Function 4/Pink Wire((7-12)	0
CV43	Function 5/Pink/Purple Wire(0-6)	0
CV44	Function 6/Green/Brown Wire(0-6)	0
CV45	Function 5/Pink/Purple Wire(7-12)	0
CV46	Function 6/Green/Brown Wire(7-12)	0
CV123	ON/OFF Rule 17 Dimming	32
CV124	ON/OFF Ditch Light Blink	8
CV134	Button Control of Motor Circuit	2
CV136	BEMF Map	2

CV2, CV5, CV6 - Basic speed table

CV2 = Start Volts
CV6 = Mid Volts
CV5 = Top Volts

Values may range from 1-255 and every value of 18 (approximately) added to one of the speed curve CV's adds about 1 volt to the motor speed at the CV being adjusted.
NOTE: 3 Point Speed Curves do not allow for parabolic speed curves. Each consecutive CV must have a value higher than, or equal to, the CV before it.

You can set the start voltage by using CV2. The higher the start voltage, the higher the locomotive's initial speed when started.
Use the maximum voltage CV5 to limit the top speed of your locomotive.

CV67 - CV94 - Advanced Speed table

In order to use the advanced speed table, you need to change the setting of CV29, to add 16 to the value of CV29 to enable the speed table function.

We recommend consulting online literature or using a software program such as JMRI Decoder Pro in order to adjust the advanced speed curve.

CV3 & CV4 - Acceleration & Deceleration rates

Acceleration is the rate at which the decoder increases speed from one speed step to the next in response to a new increase speed command. The acceleration rate (CV3) can be set to simulate train weight. Deceleration is the rate at which the decoder decreases speed from one speed step to the next in response to a new decrease speed command. The deceleration rate (CV4) can be used to simulate inertia. Just like the prototype, you can set your locomotives to get off to a slow start because of a heavy load and to take a long time to come to a stop because of the inertia of the train once it is moving.

BEMF

Back-EMF is self-adjusting and can be either on or off. Set CV61 to 1 (default) for on, 0 for off.
If you want Back-EMF to turn off after the locomotive is underway (for example, if consisted locos fight each other, this will make consisting smoother) set CV10 to the speed step at which you want it to turn off. e.g. CV10 = 15 will make Back-EMF turn off at speed step 15.

CV59 - Passenger/Coach Lighting, controlled by Function Key 0

When you want to use this function, please make sure that function keys F1 & F2 are turned off before setting. Otherwise F1 and F2 will not controlled by F0.

CV59 = 0 - Function turned off
CV59 = 1 - Function 1/Green Wire, Function 2/Purple Wire will flicker when you use F0 to power it on. Later it will stay on. Both F1 and F2 control by F0.
CV59 = 2 - Forward Headlight FL(F0F)/White Wire, Reverse Headlight FL(F0R)/Yellow Wire, Function 1/Green Wire, Function 2/Purple Wire will flicker when use F0 to power it on, then it will stay on. All lights control by F0.

CV64 - Brightness dimmer

Values of 2-6 are recommended for LEDs, 12-18 for regular 12V bulbs

CV136 - Button control of Back EMF

You can choose to turn back EMF on and off at will if you set your decoder up to make this function available. This gives your hands on control of B-EMF via you chosen function button. First set CV61 = 3. You can select which button will switch BEMF using this table.

Fn Button	CV136
5	1
6	2
7	4
8	8
9	16
10	32
11	64
12	128

CV133 - Button control of motor

There are many uses for this: turntables, cranes, conveyor belts & high current devices using up to 1 Amp. Setup is simple:
Establish the motor speed and then choose the style of button control and its done!
Setting the motor speed: This is important as there is no variable speed control in this mode, just forward or reverse, so unless you are making a model weapon or centrifuge, you are going to want a slower motor speed!

This uses CV133, range is 0~255. Start off with 60.

Choosing your preferred control method:
There are 2 options: The first will use F2 for forward and F3 for reverse. (Just press the Fn on to start, off to stop). This uses CV61. Set it to 64 and you can give it a try!

The second control option:
This will use Function 2 to turn the motor on and the forward/reverse buttons of your controller for direction. This uses CV61. Set it to 68 and see what you think.
We prefer method 1, however there is ONE advantage of the second method. If you want to power several motors like this for a crane, you can remap the functions on each of them differently, set them to the same number and control each with its own specific function buttons.

CV135 - Random Flicker Adjust

Overall speed of the flicker can be adjusted from 1-255 (1 being the fastest and 255 being the slowest).

Manual control of Rule 17 Lighting

Rule 17 Lighting: This is primarily a US lighting style, however UK diesel models often have a “day” and “night” lighting level, and this “rule 17” setup can also help you to get that to work properly in your locomotives if you think about it!
In general, this rule stipulates that light in the rear of a loco should be on & dimmed when the front light is at full brightness & importantly, that the headlight should also always be dimmed in the direction of travel when....
(1) At stations/yards where switching is underway.
(2) If a locomotive is stopped close behind another train.

(3) On non-signaled lines when a locomotive is stopped on the main and waiting for an approaching train.
(4) When a locomotive is approaching and passing the head end & rear end of a train on the adjacent track.
(5) At other times to permit clearly visible passing of hand signals or when safety of employees requires it.

Some decoders offer a very basic form of Rule 17 but we decided to do it properly. Because it requires several CVs to be set we will describe it in a series of simple steps, each properly explained.
We are going to set up front & rear lighting so that lights: * Are not directional on/off (manual on/off selection)
* Are on separate buttons (F0 and F1) and also...
* Light in the end opposite to direction auto-dims if on.
* Are NOT automatically dimmed when stopped but...
* Can be dimmed when stopped or when switching with F4 no matter which direction the loco is moving.

Now... Let's do it as a step-by-step setup - we will use the White and yellow function wires for Rule 17.
(1) We need to set CV61 to engage "Opposite Dim". Opposite dim needs 32 added to the value already in CV61. As CV61 also controls BEMF it will already be either 1 (BEMF on) or 3 (BEMF on via a function button).
So... For CV 61, enter either 1+32 = 33 or 3+32 = 35.
(2) We need to set CV64 to set the Dimming level. The range for this CV is 0~15. We find the best range to use to dim LEDS is 1~6. We use 3 with our own locomotives.
So... For CV 64, enter 3.
(3) Now we need to set White wire control / CV49 and Yellow wire control / CV50 to Rule 17 always on.
The options for this are 8 (Rule 17 fwd. only) 24 (rule 17 Rev only) or 40 (rule 17 always / manual)
So... For BOTH CV49 and CV50, enter 40.
(3) Now to reallocate function control. We are going to make White F0, Yellow F1, Green F2, Purple F3. White is already F0 so leave it. To remap the others just set their function allocation CVs to the following values.
CV34 enter 4, CV35 enter 8, CV36 enter 16.
Did you follow that OK? If so, then it is time to take a break & have a Play with Rule 17!

Further CV values not described above:

7	Manufacturer Version Number	1/2/3/4	Read Only
23	Acceleration Adjustment	0	0
24	Deceleration Adjustment	0	0
56	Dither Frequency	3	3
57	Dither Ampitude	10	10
63	Ditch Light Blink Holad Over	63	63
112	Mars Min Brightness	1	1
113	Mars Max Brightness Time	9	9
114	Mars Total Light Cycle	1	1
115	Mars Mid Brightness	6	6
116	Mars Max Brightness	22	22
117	Ditch Light Blink Rate	3	3
118	Rotary Min. Bright	1	1
119	Rotary Min. Bright Time	5	5
120	Rotary Total Light Cycle	1	1
121	Rotary Mid Brightness	15	15
122	Rotary Max Brightness	25	25